Name:

AP Calculus – Exploring Limits to Infinity

1.) Using your graphing calculator, try to guess the limits of the function $f(x)=\frac{x^2-5x+2}{2x^2-3x+1}$ as x approaches infinity and negative infinity. Make T-charts with values of x such as x = 1, 10, 100, 1000, etc.. and x = -1, -10, -100, -1000, etc..

$\lim_{x\to\infty}\frac{x^2-5x+2}{2x^2-3x+1}=$

$\lim_{x\to-\infty}\frac{x^2-5x+2}{2x^2-3x+1}=$

2.) Look at the graph of f(x). Describe what is happening graphically as the function approaches infinity and negative infinity.

3.) Investigate the limits $\lim_{x\to\infty}\frac{1}{x}$ and $\lim_{x\to-\infty}\frac{1}{x}$. What did you discover? Why does this happen?

4.) Find limits to infinity of $\lim_{x\to\infty}\frac{1}{x^n}$ for increasing integer values of "n". For example, find $\lim_{x\to\infty}\frac{1}{x^2}$, $\lim_{x\to\infty}\frac{1}{x^3}$, $\lim_{x\to\infty}\frac{1}{x^4}$, etc. What happens?

5.) Multiply the top and bottom of $f(x)=\frac{x^2-5x+2}{2x^2-3x+1}$ by $\frac{1}{x^2}$, as follows:

$$\frac{x^2-5x+2}{2x^2-3x+1}\cdot\frac{1/x^2}{1/x^2}$$

Simplify your answer.

6.) Take the limit to infinity of each of the terms in your answer. Which terms "disappear"? Which terms stay? Does your answer seem consistent with what you speculated the limit to infinity was in step 1?

7.) In the problems above you used various techniques that can be used to evaluate limits to infinity. Try using them to solve the problems below:

(a) $\lim_{x\to\infty}\frac{3x^3+2x^2-4x+5}{x^3-7x+8}=$

(b) $\lim_{x\to\infty}\frac{x^2+3x-11}{5x^3+2x^2-10}=$

(c) $\lim_{x\to\infty}\frac{x^3-3x^2+15}{25x^2-8x+16}=$